Modeling the Biscayne Bay Coastal Wetlands (BBCW) Watershed System with WASH123D-A First-Principle, Physics-Based Numerical Model

H.-P. Cheng, H.-C. Lin, C. M. Hansen, C. H. Tate, E. V. Edris, D. C. McVan, K. W. Kim, A. A. Jackson, F. C. Carson, Coastal & Hydraulics Laboratory, US Army Engineer Research & Development Center, 3909 Halls Ferry Road, Vicksburg, MS, hwai-ping.cheng@erdc.usace.army.mil, Clarissa.M.Hansen@erdc.usace.army.mil, Charles.H.Tate@erdc.usace.army.mil, Earl.V.Edris@erdc.usace.army.mil, Darla.C.McVan@erdc.usace.army.mil, KeuWhan.W.Kim@erdc.usace.army.mil, Amy.A.Jackson@erdc.usace.army.mil, Fulton.C.Carson@erdc.usace.army.mil; M. A. Granat, and B. K. Files, US Army Corps of Engineer, the Jacksonville District, 400 W. Bay Street, Jacksonville, FL, Mitch.A.Granat@saj02.usace.army.mil, Brian.K.Files@saj02.usace.army.mil

Abstract: The Biscayne Bay Coastal Wetlands (BBCW) project is one of the 40 projects included in the Florida Comprehensive Everglades Restoration Plan, CERP (http://www.evergladesplan.org/). The purpose of this project is to rehydrate wetlands and reduce point source discharge to Biscayne Bay. WASH123D (a first-principle, physics-based numerical model that computes flow and transport in a watershed system that is conceptualized as a combination of 1D channel network, 2D overland regimes, and 3D subsurface media) is used to evaluate several alternatives that have been proposed to achieve the project purpose. Among the alternatives, there are rule-controlled coastal canal structures, rule-controlled pump stations, spreader swales, stormwater treatment areas (STA), flowways, levees, culverts, roads, and backfilling canals. Specified target freshwater flows for Biscayne Bay and the wetlands within each alternative system are to be computed and used in a performance measure to determine the most appropriate alternative for the project. In this paper, we will provide an overview on the process of building the BBCW model with WASH123D, including how the model boundary and boundary conditions were determined, how the computational meshes were generated, how the crucial hydrological features and processes considered in the project alternatives are incorporated into the model, and how the surface water-subsurface water and overland water-canal water interactions are accounted for in the computational model. We will also discuss some issues that we have encountered in constructing both the conceptual and the computational models. Selected results from the model runs for various project alternatives will be given as well.